Research & Development

Programs and Projects

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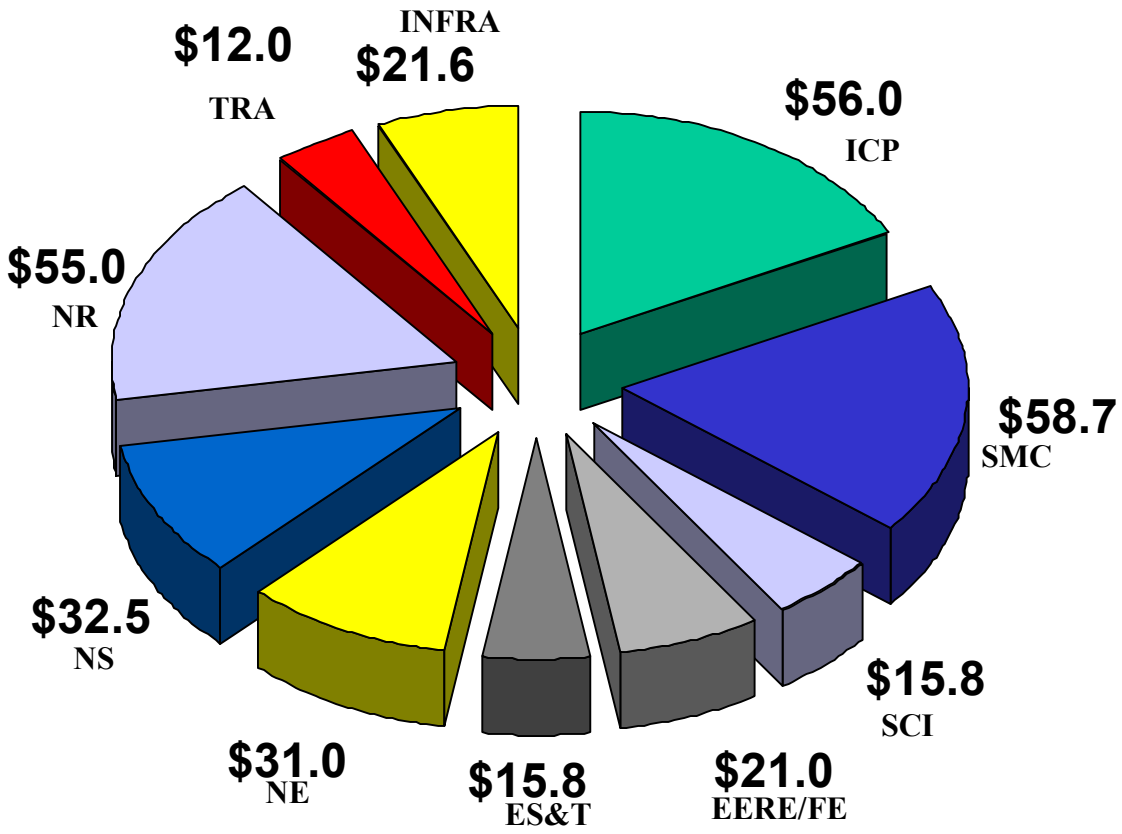
U.S. Department of Energy

June 18, 2003

INEEL Direct Funding for 2003



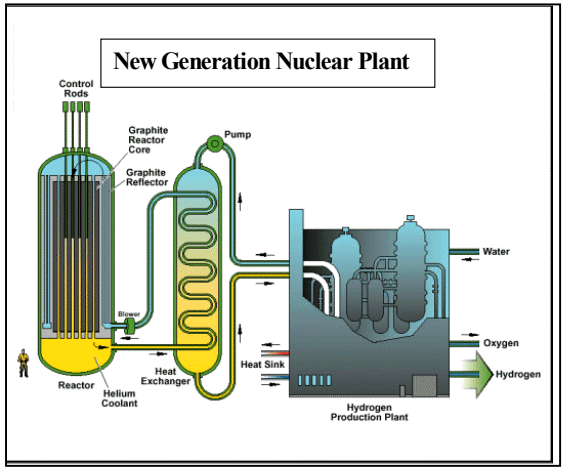
- Support to Idaho Closure Project (ICP)
- Special Manufacturing Capability (SMC)
- Core and Supporting Science (SCI
- Energy Effciencey, Renewable and Fossil Energy (EERE/FE)
- Environmental Science & Technology (ES&T)
- Nuclear Energy (NE)
- National Security (NS)
- Naval Reactors (NR)
- Test Reactor Area Operations (TRA)
- Infrastructure (INFRA)

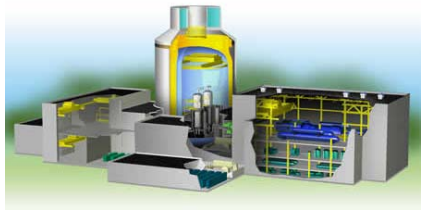
Include FY 2003 BA and Carryover

Total - $370M

Nuclear Research Programs

- NP-2010: Current commercial designs, NRC Licensing
  - **Risk, reliability and safety analysis** ; **Plant Life Extension**
- Generation IV Nuclear Energy Systems
  - **Lead Generation IV Program for NE**
  - **Participate in R&D efforts**
  - **Irradiation of fuel and materials in ATR**
  - **Possible demonstration plant at INEEL**
- Advanced Fuel Cycle Initiative
  - **Lead Advanced Fuel Cycle Program for NE**
  - **Participate in R&D efforts**
  - **Develop, build and operate a pilot demonstration plant by 2007**



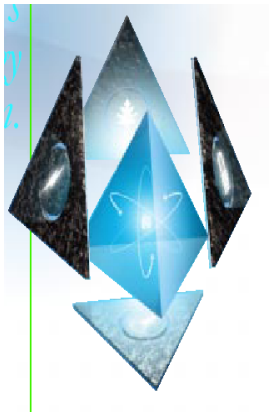


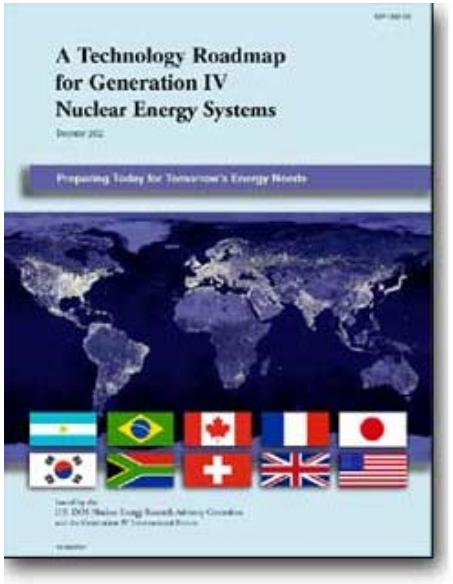
Nuclear Research Programs (cont.)

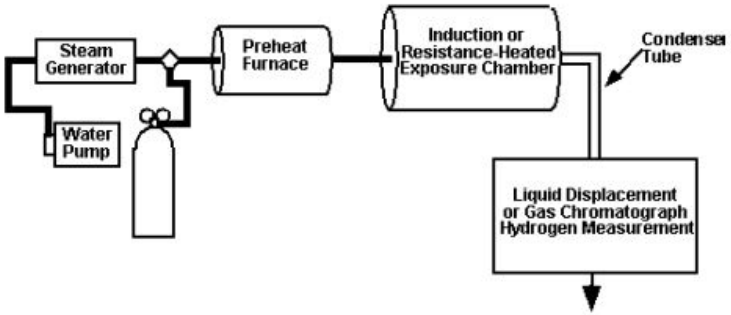
- **Space Nuclear Power**
  - Irradiation of fuel and materials in ATR
  - Design and engineering support as requested by NASA
  - Potential for ground testing of systems at the INEEL
- **Fusion Energy**
  - Fusion Safety and material performance

Nuclear Research Programs- Accomplishments

- Managed and coordinated the Generation IV program
- Formation of the Generation IV International Forum
- Developed Generation IV R&D roadmap
- Completed survey of NGNP Materials R&D needs
- Preconceptual design for AFC engineering-scale experiment
- Initiated AFC advanced fuels irradiation in ATR
- Upgraded STAR facility is operational



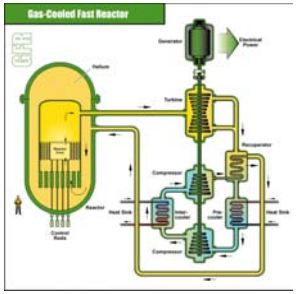


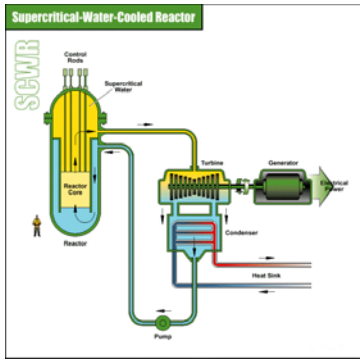


Nuclear Energy Program Goals

By 2005:

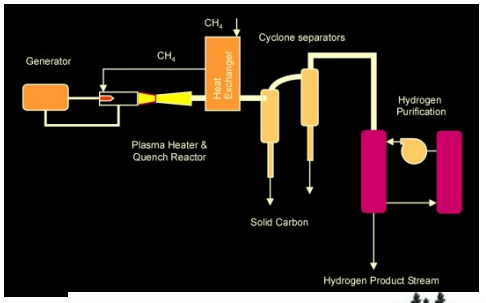
- Continue Generation IV leadership
- Initiate Generation IV Research & Development
- Implement Nuclear Hydrogen Production R&D Plan
- Initiated preconceptual design on non-nuclear hydrogen production test facility
- Initiate Generation IV advanced fuel irradiations in ATR
- Complete final installation of equipment in STAR facility
- Complete conceptual design for AFC Process Demonstration

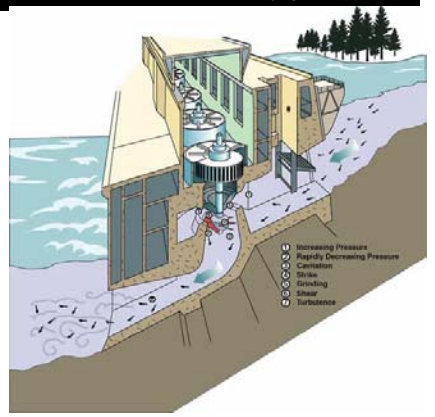


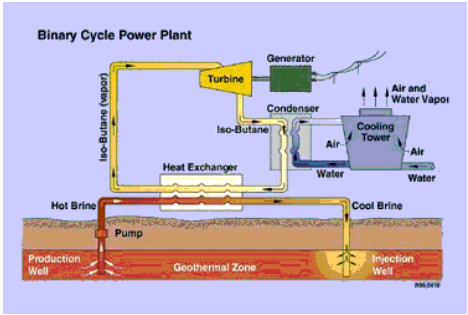


Energy Efficiency and Renewable Energy and Fossil Energy Programs

- Power Generation :
  - Bioenergy/Biomass, Wind Power, Hydropower, Geothermal Power, Hydrogen and Fuel Cell Production
- Energy Efficiency
  - Freedom Car & Vehicle Technologies, Distributed Energy & Electric Reliability
- Fossil Energy Programs

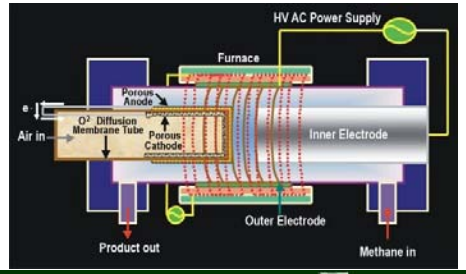






Energy Efficiency and Renewable Energy and Fossil Energy Programs Accomplishments

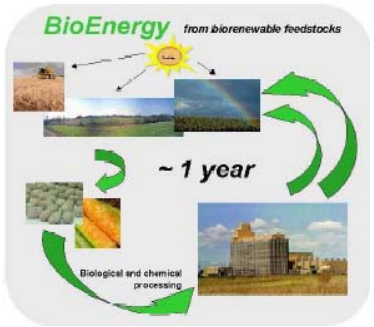
- Bioenergy
  - **-Advanced Harvester Design and Test**
  - **-Published Bioenergy Strategic Plan**
- Freedom car project for reducing oil usage in heavy vehicles
- Installation of LNG fueling stations in AZ, CA and West Yellowstone
  - -Valuable Experience for Hydrogen infrastructure
- Diesel reformer project
- Coal-Fired Steam Generating Facility to Community Reuse Org

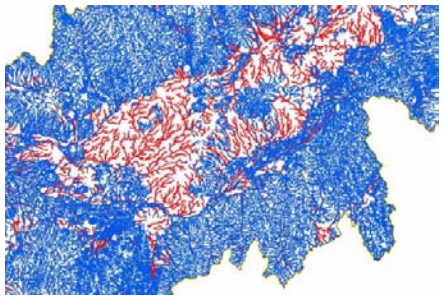


Energy Efficiency, Renewable and Fossil Energy Systems Goals

By 2005:

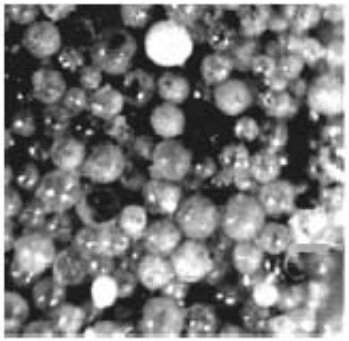
- Initiate Program for biomass feedstock harvesting of corn stover
- Complete the multi-year R&D roadmap for biomass feedstock harvesting
- Complete development of the advanced mathematical threshing model.
- Establish Major long-term role in the heavy vehicle program
- Develop Advanced vehicle modeling and testing plan for DOE-EE.
- Complete functionality testing of the Autothermal Diesel Reformer
- Implement a program for hydrogen vehicle-fueling infrastructure





Environmental Science and Technology:

- Support to ICP
  - -Remediation of vapor phase contaminants at RWMC
  - -Calcine removal, and transport to repository
  - -Sensors for measurement and characterization.
- Science and Technology for Regional needs
  - -Groundwater at previous mining and industrial sites
  - -Waste treatment for large scale agricultural processes
  - -Air pollution in rapidly growing regions
  - -Climate and growth impacts on water resources.



Environmental S&T Accomplishments

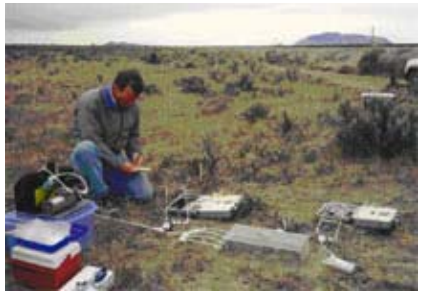
- In support of the ICP:
  - -Integrated Waste Tracking System (IWTS)
  - -Prompt Fission Neutron (PFN) probe
  - -Meso-scale and field-scale fate-and-transport experiments
  - -Percolation of water from new INTEC ponds imaged over time
  - -Mesoscale experiments in progress to define transport of contaminants

- In Support of Regional needs
  - -Workshops with EPA define needs for protection of water supplies and mine waste cleanup

Environmental S&T Goals

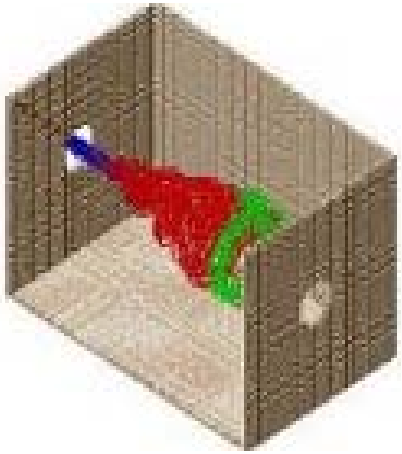
By 2005:

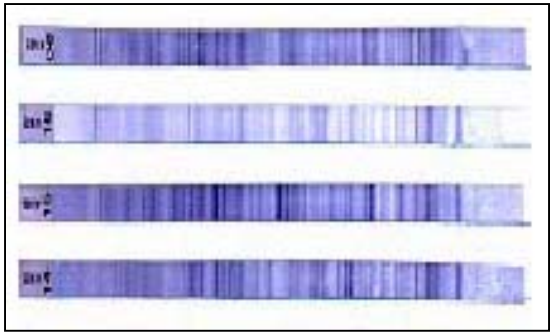
- Transfer Expertise for DOE site cleanup to Yucca Mtn.
- Demonstration of the stainless steel welding, inspection, and repair system
- Complete the ASME code case for the Ni-Cr-Mo-Gd alloy base
- Provide technical support to State of Idaho and region



Core and Supporting Research:

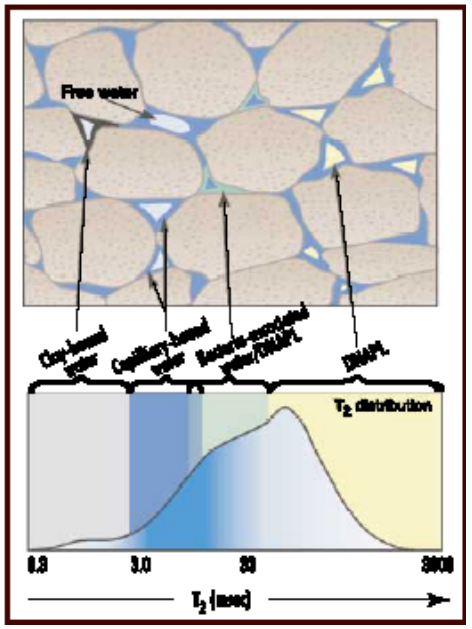
- Materials science and nano-materials
- Advanced geosciences and subsurface science
- Physics: thermal processing and nonlinear optics
- Chemistry, Biotechnology, Engineering sciences
- Advanced Computation and Modeling





Core and Supporting Research Accomplishments

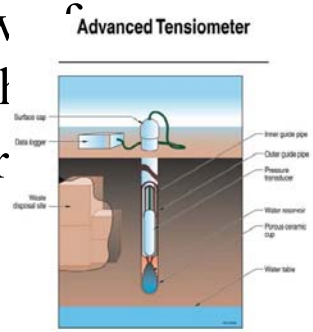
- 4 R&D 100 awards last 3 years; 15 since 1995
- *Energy@23* Award for Advanced Lithium Battery, 2001
- 10 Environmental Management Science (EMSP) Awards in 2002
- 10 NERI and 2 INERI Awards
- Over $10 M in new collaborations with Inland Northwest Research Alliance (INRA) Universities in 2002-2003



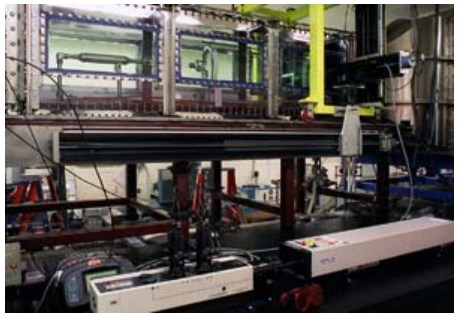
Core and Supporting Research Goals

By 2005:

- Growth in competitively funded projects and peer reviewed publications
  - Key area: advanced computational science
- Incorporate results of DOE-SC Advisory Committee Peer review Subsurface Science Research into program planning and research
- Implement acquisition strategy for advanced computing hardware connectivity
- Use Technology transfer to Drive Innovation

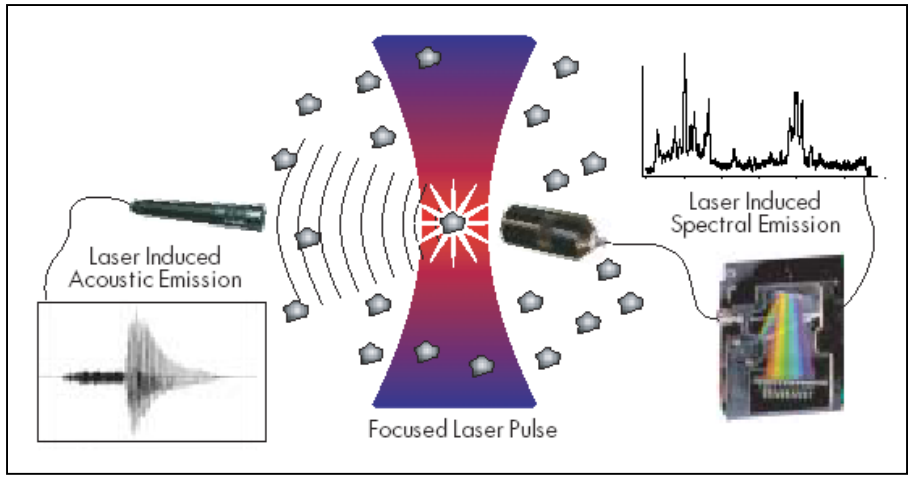


$$A_s(r,t) = \sqrt{I_s}\, e^{i(\vec{k}_s \cdot \vec{R}_s - 2\pi\nu t + \delta_{sig}(\rho,t))}$$
$$= \sqrt{I_s}\, e^{i(\vec{k}_s \cdot \vec{R}_s - 2\pi\nu t)}\, e^{i\delta_{sig0}\sin(\omega_s t + \varphi_s - \chi(\rho))}$$
$$= \sqrt{I_s}\, e^{i(\vec{k}_s \cdot \vec{R}_s - 2\pi\nu t)} \sum_{n=-\infty}^{n=\infty} J_n(\delta_{sig0})\, e^{in(\omega_s t + \varphi_s - \chi(\rho))}$$



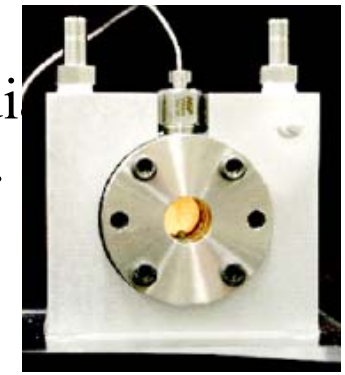
Laboratory Directed Research and Development

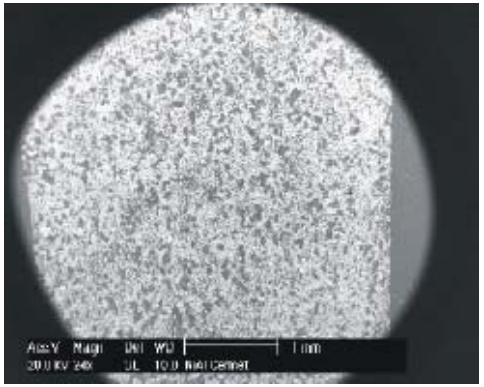
- LDRD-DOE authorized source of discretionary research
- Maintains the scientific and technological vitality of laboratory
- Selected by the Laboratory Director or designee
- Strategic investment- tied to key initiatives

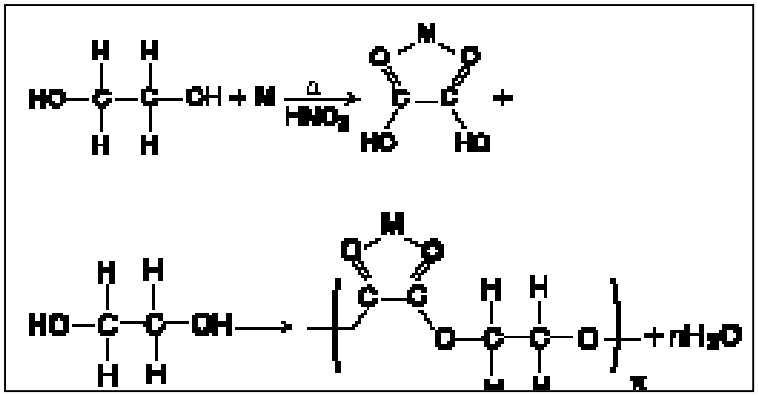


LDRD Successes: New Program Funding

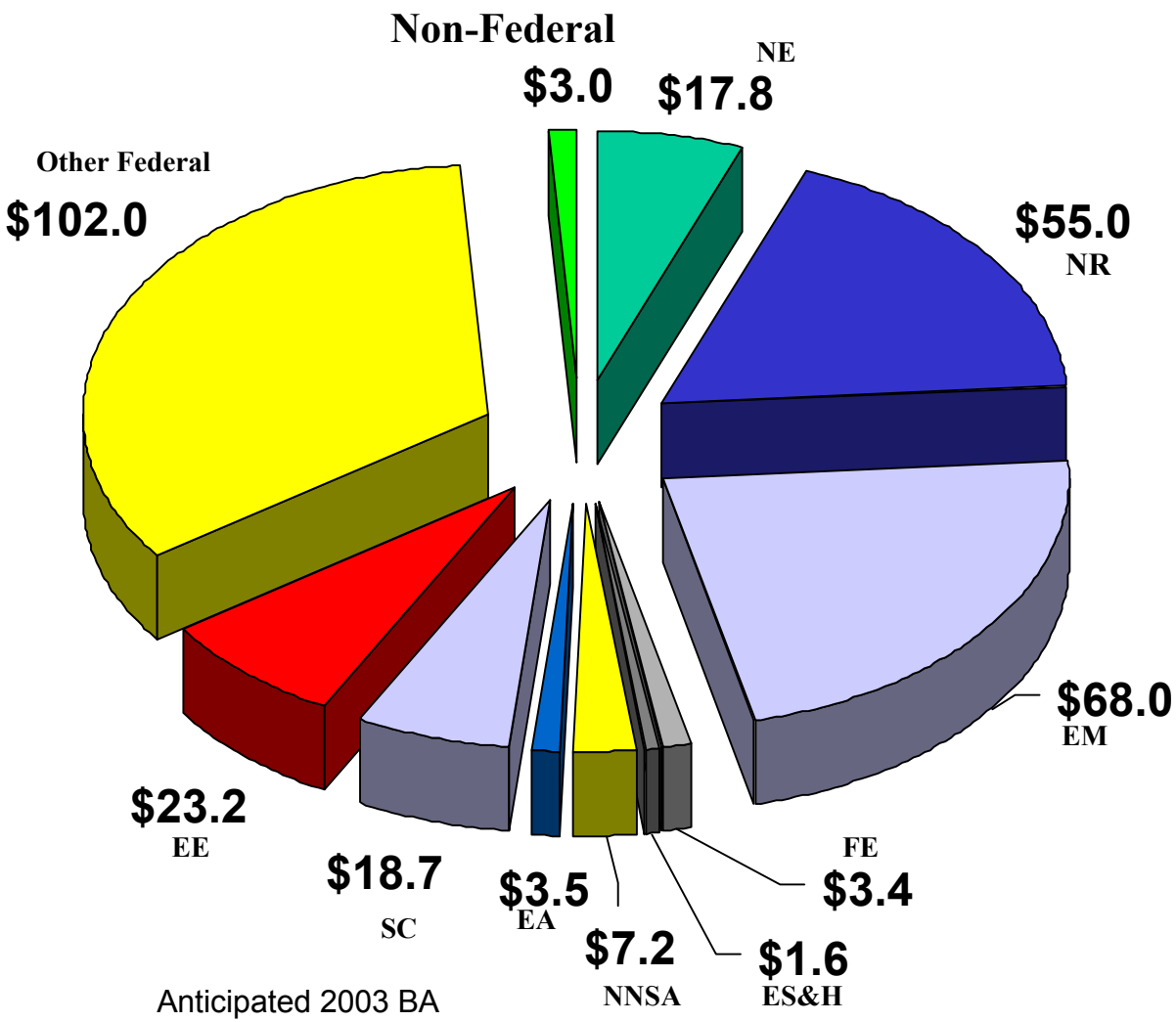
- Natural Attenuation as a Cleanup Method
- Surfactant-Enhanced Aquifer Remediation at Neutral Buoyancy
- Microbial Stability of Subsurface Solidified Waste Medi
- Human-Machine Interfaces Neutron/Gamma Dosimeter
- Novel Human Molecular Identification for forensic determination
- This year, twelve NE specific LDRD projects







INEEL 2003 R&D Funding by Program Office



- Nuclear Energy (NE)
- Naval Reactors (NR)
- Environmental Management (EM)
- Fossil Energy (FE)
- ES&H
- National Nuclear Security Agency (NNSA)
- Energy Assurance (EA)
- Science (SC)
- Energy Efficiency (EE)
- Work for other Federal Sponsors
- Work for non-Federal sponsors